IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	SCOTT P. SCHREER
Confirmation No.	3357
Serial No.:	10/086,089
Filed:	February 28, 2002
Title:	IMPROVED SYSTEM AND METHOD FOR ACCESSING....
Examiner:	Jason P. Salce
Group Art Unit:	2611

October 12, 2006

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22314-1450

DECLARATION UNDER RULE 1.132

I, Nasir Memon hereby declare as follows:

1.   I am currently Professor, Computer and Information Science Department at Polytechnic University where I have served in this capacity since 2004. Prior to this I was Associate Professor at this University for six years. Previously, I had been a visiting faculty at the Imaging Technology Department of Hewlett Packard Research Labs. I have also been Assistant Professor at Northern Illinois University, Arkansas State University and Research Assistant at University of Nebraska.

2. I hold a PhD in Computer Science from the University of the Nebraska, an MS in Computer Science from the University of Nebraska, as well a M.Sc. in mathematics from

Birla Institute of Technology and Science in India, and a Bachelor of Engineering from Birla Institute of Technology and Science in India.

3. I have previously served as a testifying expert in the field of Multimedia Digital Rights Management, Digital Watermarking, and Digital Forensics. In these fields I qualified for government grants and provided consultancy on information security, coding and steganography to the military. I have frequently lectured and headed standards committees in this area.

4. I have received numerous awards, various US Patents, have published articles and book chapters in extremely large number of journal publications and conference publications. I have chaired numerous committees, and am considered an expert in the field of digital rights management.

5. A copy of my CV is attached.

6. I have reviewed the present patent application serial number 10/086,089 which was published as US Patent Application Publication No. 2002/0080976 on June 27, 2002 (hereinafter "Schreer"). I have also reviewed the final office action issued by the United States Patent and Trademark Office dated June 9, 2006 as well as the previous office action issued by the United States Patent Office dated December 20, 2005 and the response submitted by the inventor dated March 20, 2006. I have also reviewed two references relied on by the examiner. Specifically, US Patent 6,253,193 issued to Ginter et al. (hereinafter "Ginter"), and US Patent 6,385,596 issued to Wiser et al. (hereinafter "Wiser"). I have also focused on the claims submitted by the inventor, Scott Schreer in his amendment of March 20, 2006.

7 For the specific reasons as stated hereinafter, as one skilled in the art, I do not believe that independent claims 1 and 9 are obvious over the teachings of Ginter in view of Wiser. I further believe that many of the claims dependent upon claims 1 and 9 are also not obvious over

the combination of these references. Furthermore, it is my opinion that one skilled in the art reading Schreer would find adequate support for the recitations in claims 1-9.

8. Schreer describes a method of compensating at least one rights' holder responsible for the content of a digital audio recording file, for the public performance of the content which is included in a public broadcast. Schreer essentially picks up the broadcast when it is being sent by the sender. He provides for a monitoring station that receives the broadcast just as one of the members of the public would receive it. Based upon such public broadcast, it recognizes that the sender has publicly broadcast the particular performance and credits the rights holder through the use of a compensation method.

9. Ginter is essentially interested in buying and selling of media. He describers a system, referred to as a "Virtual Distribution Environment" (VDE) which regulates, monitors and controls all information transmitted. (See column 6, lines 32 - 57). Ginter deals with interactions between the seller of the information which is transmitted within the VDE and the buyer which receives the information. Ginter is essentially interested in an area of commerce which is different from that of Schreer. The entire domain and area being addressed is substantially different. (See column 3, lines22 – 33, column 9 lines 35 - 61).

Ginter is concerned with transmitting information from a seller to a specific buyer and controlling the use of the information by the buyer. When Ginter refers to a broadcast, he refers to a specific communication between a seller and a particular user or buyer of the product which is transmitted within the container referred to as a VDE. Ginter is not interested in a public broadcast to multi-user's.

Ginter monitors the specific receiving by the user. Any sending of the information is only monitored at the receiving end by the user.

In Schreer, he is interested in monitoring the information based upon its being sent.

10. A clear way of understanding the distinction is that in Schreer once the information is broadcast, even if no user has his receiver on and no one actually receives the particular music or information being broadcast, there is still a monitoring and recording of the fact that the music or other information has been broadcast, based upon the fact that the sender has broadcast the information. Thus, even if no one is actually receiving and using it, it will still be counted as a broadcast.

In Ginter, on the other hand, if there is no specific user who has requested the information and is actually receiving it, there will be absolutely no recording of the information.

11. Although Ginter mentions and allows broadcast of information, the business models and systems he describes essentially involve monitoring the consumption of a broadcast at the user end. Applying Ginters teaching to the problem addressed by Schreer will require having a user agent with every single user that receives the broadcast content and report back to the server, Schreer elegantly solves this problem by simply monitoring the broadcast and charging the sender based on content broadcast. So only one monitoring station is needed per broadcast domain as opposed to one per user as taught by Ginter. None of the examples or figures of Ginter anticipate the solution described by Schreer,

Schreer is not user specific to the extent that a particular user has to request the information. It does not monitor the number of users involved. It does not monitor whether there is even a single user. On the other hand, it monitors the fact that the sender has publicly broadcast this information, and the monitoring station just picks this up just as it would an end user picking up a public broadcast.

12. Wiser teaches how to control the use of a performance that a user received, by restricting him so that he won't pass it on. Wiser again monitors the user receiving the information and how he makes use of it. Wiser has no ability to monitor the sending or transmission or public broadcast of the information.

13. I have specifically reviewed particular paragraphs of Ginter that were identified by the examiner in the various office actions mentioned above. Specifically, I reviewed col. 3, line 28; col. 14, line 5-28; col. 18, lines 12-13; col. 3 lines 34-35; col. 23, lines 51-59; col. 3, lines 20-24; col. 4, lines 8-13; col. 4, lines 17-20; col. 3, lines 24-29; col. 260, lines 11-15; col. 58, lines 43-46 and lines 59-64; Fig. 20; col. 53, lines 32- col 154, lines 67;col. 127, lines 6-8; col 53, lines 1-10, col. 14, lines 5-10; col. 18, lines 60-64; col. 127, lines 45-49; col. 153, lines 53-59; col. 153, lines 62-64; col. 155, lines 22-23; Fig. 16; col. 152, lines 26-27; col. 9, lines 35-60; col. 130, lines 7-11; col. 58, lines 43-46 and lines 59-64, col. 7, lines 51-52; col. 153, lines 32-col. 154, line 49; col. 127, lines 6-8; col. 53, lines 1-10; col. 14, lines 5-10; col. 18, lines 60-64; col. 127, lines 45-49; col. 153, lines 53-59 and 62-64; Fig. 16; col. 155, lines 22-23; col. 152 lines 26-27; col. 3 lines 20-24; col. 4, lines 8-18.

14. In all of the above, there is no teaching of monitoring the public broadcast transmitted by a sender regardless of whether any user receives the information or not. All of these broadcast or any reference to the transmission of information relates to the user associated with the sender and essentially monitoring the user's receiving the information rather than the sender sending the information.

15. I have also reviewed the Wiser reference and specifically including col. 23, lines 18-19; col. 11, lines 53-55; col. 23, lines 21-30 and col. 11, lines 55-57. Again, nothing at Wiser

provides any teaching that there is any monitoring at the occurrence of a sending of a broadcast, regardless of whether there is any receipt of it.

16.   I also reviewed Schreer and I believe that the claims that were submitted with the Schreer Amendment of March 20, 2006, would be understood by one skilled in the art as being taught by Schreer. Specifically, I refer to the material covered in paragraph 0044, paragraphs 0002 and 0003; paragraph 0004; paragraph 0007; paragraph 0023; paragraph 0026; and paragraph 0028.

17.   All of the above teach one skilled in the art that we are dealing with a public broadcast to users who typically receive radio or television broadcast signals of music in the like.

18.   Furthermore, paragraph 0044 refers to a monitoring means, and its use therein and elsewhere provides one skilled in the art the additional information that the monitoring means is receiving the broadcast just as an end user would receive it who is listening to the broadcast that is publicly being sent out.

19.   Accordingly, it is my belief that the invention as claimed in the Schreer Amendment of March 20, 2006, including independent claims 1 and 9 are neither, anticipated by the Ginter or Wiser nor would they be obvious taking the combination of both of them together. I believe that they are both teaching away from the Scheer invention and neither of them are providing any teaching of monitoring of the sender by means of receiving a signal that is broadcast in the usual manner of a public broadcast, and compensating the rights owner based upon such receipt of materials sent.

20.   Furthermore, I believe that the claims in the Scheer Amendment of March 20, 2006 are adequately supported by Schreer and one skilled in the art would be taught the claims from reading the specification as I reviewed.

21.   I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

10/12/06

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Personal

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Education

Ph.D. Computer Science, University of Nebraska-Lincoln, August 1992,
   Graduate Advisor: S. Magliveras and K. Sayood,
   Dissertation Title: "Image Compression Using Efficient Scan Patterns."

M.S. Computer Science, University of Nebraska-Lincoln, May 1989,
   Thesis Advisor: S. Magliveras,
   Thesis Title: "On logarithmic signatures and applications."

M.Sc. Mathematics, Birla Institute of Technology and Science, Pilani, India, 1982.

B.E. Chemical Engineering, Birla Institute of Technology and Science, Pilani, India, 1982.

Research Interests

Data Compression, Image Processing, Computer and Network Security, Multimedia Communication and Security, Digital Forensics, Steganography.

Professional Experience

Professor, Computer and Information Science Department, Polytechnic University, September 2004 to present.

Associate Professor, Computer and Information Science Department, Polytechnic University, August 1998 to August 2004.

Visiting Faculty, Imaging Technology Department, Hewlett Packard Research Labs, August 1997 to August 1998.

Assistant Professor, Computer Science Department, Northern Illinois University, August 1994 to June 1998.

Assistant Professor, Computer Science and Mathematics Department, Arkansas State University - August 1992 to 1994.

Research Assistant/Teaching Assistant, Computer Science and Engineering Department, University of Nebraska, January 1987 to May 1992.

Systems Engineer, Sigma Solvents Pvt. Ltd., Bombay, India, January 1982 to August 1986.

Awards and Patents

Jacobs Excellence in Education Award. Polytechnic University, 2002.

ISO/IEC Certificate of Appreciation. International Standards Organization, 2002.

NSF CAREER Award, *Lossless, Near-lossless and Lossy Plus Lossless Image Compression*, 1997.

US Patent 5903676, X. Wu and N. Memon, *Context-based, Adaptive, Lossless Image Codec*.

US Patent Application, D. Bhattacharjee, N. Memon and Amir Said, *Segmentation of Compound Documents*, pending approval.

US Patent Application, N. Memon and D. Tretter, *A Simple Variable Quantization Technique for JPEG Part 3*. Pending approval.

US Patent Application, G. Naumovich, N. Memon, H. Yu and M. Sosonkin. *Obfuscation by Class Coalescence*, pending approval.

US Patent Application, D. Buschsmith, N. Memon and R. Fish. *Secure Content Access Utilizing Authentication, Encryption and Firewall Technologies for Home Gateways*.

US Patent Application, K. Shanmugasundaram, N. Memon and H. Bronniman. *Pay load attribution System*. Pending Approval.

US Patent Application, M. Kharrazi, N. Memon and K. Shanmugasundaram. *Network Abuse Detection System*. Pending Approval.

US Patent Application, A. Pal, N. Memon and K. Shanmugasundaram. *Method for Evidence Reassembly*. Pending Approval.

Publications

Book Chapters and Magazine Articles

1. S. Forchammer and N. Memon. Lossless Image Compression. *Document and Image Compression*. M. Barni and F. Bartoloni, editors. To appear 2005.

2. M. Chen, N. Memon and E. Wong. Binary Image Watermarking. *Multimedia Security: Steganography and Digital Watermarking Techniques for Protection of Intellectual Property*, Idea Group Publishing, To appear July 2004.

3. R. Chandramouli and N. Memon. Image Steganalysis. *Optical and Digital Techniques for Information Security*, Springer Verlag, December 2003.

4. M. Ramkumar and N. Memon. Making a Mark. *Optical Engineering Magazine*, PP 20-23, January 2003.

5. T. Suel and N. Memon. Algorithms for Delta Compression and Remote File Synchronization. *Handbook of Lossless Image Compression*, CRC Press, 2002.

6. R. Chandramouli, N. Memon, M. Rabbani. Digital Watermarking. *Encyclopedia of Imaging Science and Technology*. J. Hornak, Editor. John Wiley, October 2001.

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7. R. Ansari and N. Memon. The JPEG Standard. *Handbook of Image and Video Processing*, A. Bovik, Editor, Academic Press, 2000. Second Edition 2005.

8. R. Ansari and N. Memon. The JPEG Lossless Compression Standards. *Handbook of Image and Video Processing*. A. Bovik, Editor, Academic Press, 2000. Second Edition 2005.

9. D. Tretter, N. Memon and C. Bouman. Multispectral Image Compression. *Handbook of Image and Video Processing*. A. Bovik, Editor, Academic Press, 2000. Second Edition 2005.

10. K. Sayood and N. Memon. Lossless Compression. In *Handbook of Communications*. J. Gibson, Editor, CRC Press, 1996. Second Edition 2001.

11. N. Memon and K. Sayood. Facsimile Compression. In *Handbook of Communications*. J. Gibson, Editor, CRC Press, 1996. Second Edition 2001.

Journal Publications

1. I. Avcibas, M. Kharrazi, N. Memon and B. Sankur. Image steganalysis using binary similarity measures. Accepted for publication. *EURASIP Journal of Applied Signal Processing*, March 2005.

2. J. Zambreno, A. Choudhary, R. Simha, N. Memon. SAFEOPS: An approach to embedded software security", ACM Transactions on Embedded Systems, Feb. 2005.

3. Anandabrata Pal and Nasir Memon. Automated reassembly of file fragmented images using greedy algorithms. Accepted for publication, *IEEE Transactions on Image processing*, January 2005.

4. Perceptual Audio Hashing Functions. H. Ozer, B. Sankur, N. Memon and E. Anarim. Accepted for publication *EURASIP Journal of Applied Signal Processing*. March 2005.

5. S. Weidenbeck, J. Waters. J. C. Birget, A. Brodskiy and N. Memon. PassPoints: Design and Evaluation of a Graphical Password System. To appear in *International Journal of Human-Computer Studies for the Special Issue on Usable Privacy and Security*. May 2005.

6. J. C. Birget, D. Hong and N. Memon. Robust discretization, with an application to graphical passwords. Submitted to *IEEE Transactions on Information Forensics and Security*, 2005.

7. M. Ramkumar and N. Memon. An Efficient Key Pre-Distribution Scheme for Ad-Hoc Network Security. *IEEE Journal on Selected Areas in Communication.*, 23(3):611-621, March 2005.

8. R. Radhakrishnan, M. Kharrazi and N. Memon. Data Masking: A New Approach for Data Hiding? *Journal of VLSI Signal Processing Systems*, Accepted for Publication, 2004.

9. R. Radhakrishnan, Y. Xiong and N. Memon. On the Security of Visual Hash. *Journal of Electronic Imaging*, Accepted for Publication, 2004.

10. D. Chen, Y-J Chiang, N. Memon and X. Wu. Optimal Alphabet Partitioning for Semi-Adaptive Coding. *IEEE Transactions on Communications*, Accepted for Publication, 2003.

11. I. Avcibas, N. Memon, B. Sankur, K. Sayood. A Progressive Lossless/Near-Lossless Image Compression Algorithm. *IEEE Transactions on Communications*, Accepted for Publication, 2003.

12. V. Padman, N. Memon, P. Frankl and G. Naumovich. Design and Implementation of an Information Security Laboratory. *Journal of Information Warfare*, Volume 2, Issue 3, July 2003.

13. G. Naumovich, N. Memon. Preventing Piracy, Reverse Engineering and Tampering. *IEEE Computer*, 36(7):64-71. July 2003.

14. P. Wong and N. Memon. Image Processing for Half-tones, *IEEE Signal Processing*, 20(4):59-70, July 2003.

15. R. Chandramouli and N. Memon. On Sequential Watermark Detection. *IEEE Transactions on Signal Processing*. 51 (4):1034-1044, April 2003.

16. I. Avcibas, N. Memon, B. Sankur. Steganalysis using Image Quality Metrics. *IEEE Transactions on Image Processing*, 12(1): 221-229, February 2003.

17. R. Radhakrishnan , N. Memon On the Security of the SARI Image Authentication System. *IEEE Transactions on Circuits and Systems for Video Technology*, 12(11):1030-1033, November 2002.

18. J. Fridrich, M. Goljan and N. Memon. Cryptanalysis of the Yeung-Mintzer Fragile Watermarking Technique. *Journal of Electronic Imaging*, 11(02), 262-274, April 2002.

19. I. Avcibas, N. Memon, B. Sankur, K. Sayood. A Progressive Lossless/Near-Lossless Image Compression Algorithm. *IEEE Signal Processing Letters*, 9(10):312-314, February 2002.

20. K. Gopalakrishnan, N. Memon and P. Vora. Protocols for Watermark Verification. *IEEE Multimedia*, 8(4):66-70, October 2001.

21. P. Wong and N. Memon. Secret and Public Key Image Watermarking Schemes for Image Authentication and Ownership Verification. *IEEE Transactions on Image Processing*, 10(10): 1593-1601, October 2001.

22. N. Memon and P. Wong. A Buyer-Seller Watermarking Protocol. *IEEE Transactions on Image Processing*, 10(4):643-649, April 2001.

23. N.Memon, D. Neuhoff and S. Shende. On Scanning Techniques for Context-based Lossless Image Compression. *IEEE Transactions on Image Processing*, 9(11):1837 - 1848, November 2000.

24. X. Wu and N. Memon. Context-Based Lossless Interband Compression - Extending CALIC. *IEEE Transactions on Image Processing*, 9(6):982-993, June 2000.

25. M. Holliman and N. Memon. Counterfeiting Attacks and Blockwise Independent Watermarking Techniques. *IEEE Transactions on Image Processing*, 9(3):432-441, March 2000.

26. N.Memon, X. Kong and J. Cinkler. Context-based Lossless and Near-lossless Compression of EEG Signals. *IEEE Transactions on Information Technology in Biomedicine*, 3(3):231-238, September, 1999.

27. N. Memon and P. Wong. Digital Watermarks: Protecting Multimedia Content. *Communications of the ACM*, 47(7):35-43, July 1998.

28. R. Ansari, N. Memon and E. Ceran. Near-lossless Image Compression Techniques. *Journal of Electronic Imaging*, 7(3):486-494, July 1998.

29. S. Craver, N. Memon, B. Yeo and M. Yeung. Resolving Rightful Ownership with Invisible Watermarking Techniques: Limitations, Attacks, and Implications. *IEEE Journal on Selected Areas in Communications*, 16(4):573-586, May 1998.

30. N. Memon. A 2-D Vector Excitation Coding Technique with Prediction Patterns. *Signal Processing*, 67(2):163-172, March 1998.

31. N. Memon and X. Wu. Recent Developments in Lossless Image Compression. *The Computer Journal*, 40(1):117-126, June 1997.

32. N. Memon and R. Rodila. Transcoding GIF images to JPEG-LS. *IEEE Transactions on Consumer Electronics*, 43(3):423-429, June 1997.

33. X. Wu and N. Memon. CALIC - A Context-based, Adaptive, Lossless Image Coding Scheme. *IEEE Transactions on Communications*. 45(4):437-444, April 1997.

34. N. Memon and V. Ayalur. Optimal Re-ordering of Color Maps for Lossless Image Compression. *IEEE Transactions on Image processing*, 5(11):1522-1527, November 1996.

35. N. Memon and K. Sayood. Lossless Compression of Video Sequences. *IEEE Transactions on Communications*, 44(10)1340:1345, October, 1996.

36. N. Memon and K. Sayood. Scan Predictive Vector Quantization of Multi-spectral Images. *IEEE Transactions on Image Processing*, 5(2):330-337, February 1996.

37. N. Memon, K. Sayood, and S. Magliveras. Lossless Image Compression with a Codebook of Block Scans. *IEEE Journal on Selected Areas in Communications*, 13(1):24-31, January 1995.

38. N. Memon and K. Sayood. Lossless Image Compression of RGB Color Images. *Optical Engineering*, 34(6):1711-1717, June 1995.

39. N. Memon, K. Sayood, and S. Magliveras. Lossless Compression of Multi-spectral Image Data. *IEEE Transactions on Geosciences and Remote Sensing*, 32(2):282-289, March 1994.

40. N. Memon, K. Sayood, and S. Magliveras. A Simple Technique for Enhancing the Performance of Lossy Plus Lossless Image Compression Schemes. *Journal of Electronic Imaging*, 2(3):245-252, 1993.

41. S. Magliveras, N. Memon, and K. Sayood. Tree Codes for Lossless Image Compression. *Congressus Numerantium*, 95:117-130, 1993.

42. S. Magliveras and N. Memon. Algebraic Properties of Cryptosystem PGM. *Journal of Cryptology*, 5:167-183, 1992.

43. S. Magliveras and N. Memon. Complexity Tests for Cryptosystem PGM. *Congressus Numerantium*, 79:61-68, 1990.

44. S. Magliveras and N. Memon. Linear Complexity Profile Analysis of the PGM Cryptosystem. *Congressus Numerantium*, 72:51-60, 1989.

Conference Publications

1. Source camera identification based on CFA interpolation, S. Bayram, H. T. Sencar, N. Memon, *ICIP - International Conference on Image Processing*, Genoa, Italy, September 2005.

2. D. Chen, Y-J Chiang, N. Memon, X. Wu. Geometry Compression of Tetrahedral Meshes Using Optimized Prediction. Accepted for presentation, *EUSIPCO - European Signal Processing Conference*, Turkey, September 2005.

3. Sevinc Bayram, Ismail Avcibas, Bulent Sankur, Nasir Memon Image manipulation detection with binary similarity measures. Accepted for presentation, *EUSIPCO - European Signal Processing Conference*, Turkey, September 2005.

4. Y. Sutcu. T. Sencar and N. Memon. A Secure Biometric Authentication Scheme Based on Robust Hashing. *ACM Multimedia Security Workshop*, New York, August 2005.

5. S. Weidenbeck, J. Waters. J. C. Birget, A. Brodskiy and N. Memon. Authentication Using Graphical Passwords: Effects of Tolerance and Image Choice. *ACM Symposium on Usable Privacy and Security*, Pittsburg, July 2005.

6. V. Padman and N. Memon. Design of a Virtual Laboratory for Information Assurance Research and Education. *National Colloquium for Information Systems Security Education*. Atlanta, July 2005.

7. D.Chen, Y.-J. Chiang, N. Memon, and X. Wu. Optimized Prediction for Geometry Compression of Triangle Meshes. *Proceedings of Data Compression Conference*, pp 83-92, Utah, March 2005.

8. 11. M. Ramkumar, N. Memon, KPI: A Security Infrastructure for Trusted Devices, Pre-Conference Workshop, *12th Annual Network and Distributed System Security Symposium*, San Diego, California, February 2005.

9. K. Shanmugasundaram, N. Memon and H. Broinniman. Integrating Forensic Support in the Network *Digital Forensics Worshop*, Orlando, February 2005.

10. M. Kharrazi, T. H. Sencar, N. Memon. Benchmarking steganographic and steganalysis techniques, *Security and Watermarking of Multimedia Contents*, San Jose, CA, January 16-20, 2005.

11. K. Petrowski, M. Kharrazi, H. T. Sencar, N. Memon. PSteg: steganographic embedding through patching, *IEEE International Conference on Acoustics, Speech, and Signal Processing* ,March, 2005.

12. M. Ramkumar, N. Memon, A DRM Based on Renewable Broadcast Encryption, to be presented at the Visual Communications and Image Processing (VCIP) Conference, Beijing, China, July 2005.

13. M. Ramkumar, N. Memon, KPI: A Security Infrastructure for Trusted Devices, Pre-Conference Workshop, 12th Annual Network and Distributed System Security Symposium, San Diego, California, February 2005

14. M. Kharrazi, K. Shanmugasundaram and N. Memon. Nabs: A System for Detecting Resource Abuses via Characterization of Flow Content Type, *ACSAC - Annual Computer Security Applications Conference*, Tucson, Arizona, November 2004.

6

15. Blind Source Camera Identification, M. Kharrazi, H. T. Sencar, and N. Memon. *ICIP - International Conference on Image Processing*, Singapore, September 2004.

16. I. Avcibas, S. Bayram, N. Memon, M. Ramkumar, B. Sankur. A Classifier Design for Detecting Image Manipulations, *ICIP - International Conference on Image Processing*, Singapore, September 2004.

17. H. Ozer, B. Sankur, and N. Memon. Robust Audio Hashing for Audio Identification. *EUSIPCO - European Signal Processing Conference*, October 2004.

18. M. Ramkumar, N. Memon. An Efficient Random Key Pre-distribution Scheme, In proceedings of *Globecom 04*, November 2004.

19. Y. Zhang, M. Ramkumar and N. Memon. Information Flow Based Routing Algorithms for Wireless Sensor Networks. In proceedings of *Globecom 04*, November 2004.

20. K. Shanmugasundaram, H. Broinnimann and N. Memon. Payload Attribution via Hierarchical Bloom Filters, 11th ACM Conference on Computer and Communications Security, Washington DC, October 2004.

21. M. Ramkumar, N. Memon, Preloaded Key Distribution Schemes for Ad Hoc Networks , International Conference on Computing, Communications and Control Technologies (CCCT) 2004, Austin, TX, Aug 2004.

22. M. Ramkumar and N. Memon. On the Security of Random Key Pre-Distribution Schemes. *IEEE Information Assurance Workshop*. Westpoint, NY, June 2004.

23. M. Kharrazi, K. Shanmugasundaram and N. Memon. Network Abuse Detection via Flow Content Characterization. *IEEE Information Assurance Workshop*. Westpoint, NY, June 2004.

24. M. Jiang, X. Wu, E. Wong and N. Memon. Steganalysis of Boundary-based Steganography using Autoregressive Model of Digital Boundaries. *IEEE Conference on Multimedia and Expo*, Taiwan, 2004. M. Ramkumar, N. Memon, Multiple Authorship Protocol For Watermarking, 38th Annual Conference on Information Sciences and Systems (CISS) Princeton, NJ, March 2004.

25. M. Ramkumar, N. Memon, R. Simha. Pre-Loaded Key Based Multicast and Broadcast Authentication in Mobile Ad-Hoc Networks, *Proceedings of Globecom 2003*, San Francisco, CA, December 2003.

26. K. Shanmugasundaram and N. Memon. Automatic Reassembly of Document Fragments via Context Based Statistical Models, *19th Annual Computer Security Applications Conference*, Las Vegas, Nevada, December 8-12, 2003.

27. M. Sosonkin, G. Naumovich and N. Memon. Obfuscation of Design Intent in Object-Oriented Applications, *Digital Rights Management Workshop*, Washington DC, October 2003.

28. R. Chandramouli, M. Kharrazi and N. Memon. Image Based Steganography: Concepts and Practice, *Proceedings of International Workshop on Digital Watermarking*, Springer Verlag LNCS, Seoul, October 2003.

7

29. K. Shanmugasundaram, N. Memon, A. Savant and H. Broinnimann. ForNet: A Distributed Forensics System, *Proceedings of Mathematical Models and Architectures for Computer and Network Security*, Springer Verlag LNCS, St. Petersburg, Russia, September 2003.

30. V. Ananthapadmanabhan, P. Frankl, N. Memon and G. Naumovich. Design of a Laboratory for Information Security Education, *Proceedings of World Conference on Information Security Education*, pp 61-73, Monterey, CA, July 2003.

31. A. Pal, K. Shanmugasundaram and N. Memon. Reassembing Image Fragments, *Proceedings ICASSP*, Honk Kong, April 2003.

32. D. Chen, Y-J Chiang, N. Memon and X. Wu. Optimal Alphabet Partitioning for Semi-Adaptive Coding of Sources of Unknown Sparse Distributions. *Proceedings of the Data Compression Conference*, pp 372-381, IEEE Press, Utah, March 2003.

33. L. Butterman and N. Memon. An Error-Resilient Blocksorting Compression Algorithm. *Proceedings of the Data Compression Conference*, pp 417, Utah, March 2003.

34. R. Chandramouli, N. Memon. Steganographic Capacity from an Active Steganalysis Perspective. *Security and Watermarking of Multimedia Contents*, Santa Clara, CA, January 2003.

35. R. Radhakrishnan, X. Zhang and N. Memon. On The Security of the Visual Hash Function. *Security and Watermarking of Multimedia Contents*, Santa Clara, CA, January 2003.

36. R. Radhakrishnan, K. Shanmugasundaram and N. Memon. Data Masking: A Secure-Covert Channel Paradigm. *IEEE Workshop on Multimedia*, St. Thomas, France, October 2002.

37. Z. Ouyang, N. Memon, T. Suel. Cluster Based Delta Compression of a Collection of Files. *WISE 02*, Singapore, November 2002.

38. I. Avcibas, N. Memon, B. Sankur. Image Steganalysis with Binary Similarity Measures. *IEEE International Conference on Image Processing*, Rochester, New York, September 2002.

39. S. Dumitrescu, X. Wu, N. Memon. On Steganalysis of Random LSB Embedding in Continuous-tone Images. *IEEE International Conference on Image Processing*, Rochester, New York, September 2002.

40. K. Shanmugasundaram and N. Memon. Automatic Reassembly of Document Fragments via Data Compression. *Digital Forensics Research Workshop*, Syracuse, NY, August 2002.

41. R. Chandramouli, G. Li and N. Memon. Adaptive Steganography *Security and Watermarking of Multimedia Contents*, San Jose, CA, February 2002.

42. R. Radhakrishnan and N. Memon. Audio Content Authentication Based on Psycho-Acoustic Model. *Security and Watermarking of Multimedia Contents*, San Jose, CA, February 2002.

43. D. Mukherjee, N. Memon, A. Said. JPEG-matched MRC compression of compound documents. *IEEE International Conference on Image Processing*, Thessaloniki, Greece, October 2001.

44. C. Chandramouli and N. Memon. Analysis of LSB-based Image Steganography techniques. *IEEE International Conference on Image Processing*, Thessaloniki, Greece, October 2001.

8

45. R. Regunathan and N. Memon. On the Security of the SARI Image Authentication System. *IEEE International Conference on Image Processing*, Thessaloniki, Greece, October 2001.

46. I. Avcibas, N. Memon and B. Sankur. Steganalysis based on Image Quality Metrics - Differentiating between techniques. *IEEE Workshop on Multimedia*, Cannes, France, October 2001.

47. M. Chen, E. Wong, N. Memon and S. Adams. Recent Developments in Document Image Watermarking and Data Hiding. *Multimedia Systems and Applications, SPIE Opticomm*, Denver, August 2001.

48. I. Avcibas, N. Memon and B. Sankur. Steganalysis using Image Quality Metrics. *Security and Watermarking of Multimedia Contents*, San Jose, CA, February 2001.

49. Q. Mei, E. Wong and N. Memon. Data Hiding in Binary Text Documents. *Security and Watermarking of Multimedia Contents*, San Jose, CA, February 2001.

50. I. Avcibas, N. Memon, B. Sankur and K. Sayood. Lossless Image Compression Based on Successive Refinement. *Visual Communications and Image Processing*, San Jose, CA, February 2001.

51. R. Chandramouli and N. Memon. A Distributed Detection Framework for Steganalysis. *ACM Workshop on Multimedia Security*, pp 123-126, Los Angeles, CA, November 2000.

52. N. Memon, D. Neuhoff and S. Shende. Optimizing Prediction Gain in Symmetric Axial Scans. *IEEE International Conference on Image Processing*, Vancouver, Canada, September 2000.

53. Z. Ouyang, N. Memon and T. Suel. Using Delta Encoding for Compressing Related Web Pages. Submitted to the *Data Compression Conference '01*, November 2000.

54. L. Butterman and N. Memon. Error Resilient Block Sorting. Submitted to the *Data Compression Conference '01*, November 2000.

55. R. Chandramouli and N. Memon. How many pixels to Watermark? Special Session of Multimedia Content Protection, IEEE International Conference on Information Technology: Coding and Computing, Las Vegas, NV, March 2000.

56. N. Memon and D. Tretter. A Method for Variable Quantization in JPEG for Improved Perceptual Quality. *Visual Communications and Image Processing*, San Jose CA, February 2000.

57. P. Wong and N. Memon. Secret and Public Key Authentication Watermarking Schemes that Resist Vector Quantization Attack. Proc. SPIE Vol 3971, p. 428 - 437, *Security and Watermarking of Multimedia Contents II*, San Jose, CA, February 2000.

58. J. Fridrich, M. Goljan, and N. Memon. Further Attacks on Yeung-Mintzer Fragile Watermarking Scheme. *Security and Watermarking of Multimedia Contents*, San Jose, CA, February 2000.

59. N. Memon, P. Vora, B-L Yeo and M. Yeung. Distortion Bounded Authentication Techniques. *Security and Watermarking of Multimedia Contents*, San Jose, CA, February 2000.

60. I. Avcibas, B. Sankur, K. Sayood, N. Memon. Component Ratio Preserving Compression for Remote Sensing Applications. *Visual Communications and Image Processing*, San Jose, CA, February 2000.

61. K. Gopalakrishnan, N. Memon and P. Vora. Protocols for Watermark Verification. Workshop on Multimedia Security. *ACM Multimedia Conference*, Orlando, FL, October 1999.

62. M. Holliman, N. Memon and M. Yeung. On the Need for Image Dependent Keys in Watermarking. Proceedings of the *Second Workshop on Multimedia*, Newark, NJ, March 1999.

63. M. Holliman, N. Memon and M. Yeung. Watermark estimation through local pixel correlation. *Security and Watermarking of Multimedia Content*, San Jose, CA, January 1999

64. N. Memon, P. Wong and S. Shende. On the Security of the Yeung-Mintzer Fragile Watermarking Technique. *Proceedings of PICS Conference*, Savannah, GA, April 1999.

65. N. Memon and P. Wong. A Buyer-Seller Watermarking Protocol Based on Amplitude Modulation and the El-Gamal Public Key Cryptosystem. *Security and Watermarking of Multimedia Content*, San Jose, CA, January 1998.

66. N. Memon and P. Wong. A Buyer-Seller Watermarking Protocol. In *IEEE Workshop on Multimedia Signal Processing*, Los Angeles, CA, November 1998.

67. N. Memon and P. Vora. Authentication Techniques for Multimedia Content. *Multimedia Systems and Applications*, Boston, MA, October 1998.

68. N. Memon. Efficient Rice-Golomb Coding techniques for DCT Coefficients. Proceedings *IEEE International Conference on Image Processing*, Chicago, IL, September 1998.

69. N. Memon, X. Wu and B. Yeo. Entropy Coding Techniques for Lossless Image Compression with Reversible Integer Wavelet Transforms. Proceedings *IEEE International Conference on Image Processing*, Chicago, IL, September 1998.

70. N. Memon, D. Neuhoff and S. Shende. On Scanning Techniques for Lossless Compression with Limited Context-Supports. Proceedings *IEEE International Conference on Image Processing*, Chicago, IL, September 1998.

71. M. Holliman and N. Memon. Counterfeiting Attacks for Linear Watermarking Techniques. Workshop on Multimedia Security, *IEEE Multimedia Conference*, Dallas, TX, July 1998.

72. R. Ansari, E. Ceran and N. Memon. Near-lossless Image Compression. Proceedings of *Visual Communications and Image Processing*, San Jose, CA, January 1998.

73. X. Wu and N. Memon. Inter-band Lossless Image Compression. Proceedings of the *Data Compression Conference*, Snowbird, UT, March 1998.

74. M. Holliman, N. Memon, M. Yeung and B-L. Yeo. Fast and Adaptive Public Watermarking Technique. *Multimedia Databases*, San Jose, CA, January 1998 .

75. N. Memon, D. Neuhoff and S. Shende. An Analysis of Some Common Scanning Techniques For Lossless Image Coding. Proceedings of 31'st *Asilomar Conference*, Monterey, CA, November 1997.

76. J. Cinkler, X. Kong and N. Memon. Lossless and Near-lossless Compression of EEG Signals. Proceedings of 31'st *Asilomar Conference*, Monterey, CA, November 1997.

77. X. Kong, T. Qui, N. Memon and M. Tahernazadi. Evoked Potential Compression using AOTLC and DPCM. Proceedings of *Engineering in Medicine and Biology Conference*, Chicago, IL, November 1997.

78. N. Memon and N. Moayeri. A New Distortion Criteria for Near-Lossless Image Compression. Proceedings of *International Conference on Image Processing*, Santa Barbara, CA, October 1997.

79. S. Craver, N. Memon, B. Yeo and M. Yeung. On the Invertibility of Invisible Watermarking Techniques. Proceedings of *IEEE International Conference on Image Processing*, Santa Barbara, CA, October 1997.

80. D. Benham, N. Memon, B. Yeo and M. Yeung. Fast Watermarking of Compressed Images in DCT Domain. Proceedings of *International Conference on Imaging Science, Systems, and Applications* (CISST'97), Las Vegas, NV, July 1997.

81. N. Memon and R. Rodila. Optimal conversion of GIF images to JPEG-LS. Proceedings of *IEEE International Conference on Consumer Electronics*, Chicago IL, January 1997.

82. S. Craver, N. Memon, B. Yeo and M. Yeung. Can Invisible Watermarks Resolve Rightful Ownership? *Multimedia Security*, San Jose, CA, February 1997. Also appears as IBM Technical Report RC 20509 (90894), IBM Cyber Journal.

83. N. Memon, V. Sippy and X. Wu, An Interband Coding Extension of New Lossless JPEG Standard. Proceedings of *Visual Communications and Image Processing*, San Jose, CA, January 1997.

84. N. Memon, M. Tahernazadi and V. Yellapantula Lossless Compression of Images Using Subband Decomposition. Proceedings of the *IEEE International Conference on Consumer Electronics*, Chicago, IL, June 1996.

85. X. Wu, N. Memon, G. Langdon. The JPEG Lossless Image Compression Project and Convergence to High Compressibility. Proceedings of the *NASA/Industry Workshop on Data Compression*, pages 71-80, JPL Publication 96-11, Snowbird, UT, April 1996.

86. N. Memon, V. Sippy and X. Wu. A Comparison of the Prediction Schemes Proposed for a New Standard on Lossless Coding of Continuous-tone Still Images. Proceedings of *International Symposium on Circuits and Systems* Volume 2, pages 309-312, Atlanta, GA, May 1996.

87. N. Memon. A Bounded Distortion Coding Technique for Hyper-Spectral Image Data. Proceedings of *IEEE International Symposium on Geosciences and Remote Sensing 96*, Lincoln, NE, May 1996.

88. A. Harris and N. Memon. A Very Low Bit-rate Video Codec Using Binary Segmentation Trees. Proceedings of *International Telecommunication Conference*, Istanbul, Turkey, 1996.

89. X. Wu and N. Memon. CALIC - A Context-based, Adaptive, Lossless Image Coding Scheme. Proceedings of *International Conference on Acoustics, Speech and Signal Processing*, Volume IV, pages 1891-1894, Atlanta, GA, May 1996.

11

90. N. Memon. A Vector Excitation Coding Technique for Image Data. *Still Image Compression.* SPIE Proceedings, pages 131-140, San Jose, CA, January 1996.

91. N. Memon and V. Ayalur. Re-ordering Palettes for Archiving Color-mapped Images. *Digital Image Storage and Archival Systems.* SPIE Proceedings Volume 2606, pages 221-231, Boston, MA, October 1995.

92. N. Memon and K. Sayood. Asymmetric Lossless Image Compression. Proceedings of the *Second IEEE International Conference on Image Processing.* IEEE Press, Volume III, pages 97-100, Washington DC, September 1995.

93. N. Memon and N. Galatsanos. A Spatially Adaptive Spectral Re-ordering Technique for Lossless Coding of Hyper-spectral Images. *1995 Science Information Management and Data Compression Workshop,* NASA Conference Publication 3315, pages 1-11, Greenbelt, MD, March 1995.

94. N. Memon and K. Sayood. Lossless Image Compression - a Comparative Study. *Still Image Compression,* pages 8–20. SPIE Proceedings Volume 2418, San Jose, January 1995.

95. N. Memon and K. Sayood. Asymmetric Lossless Image Compression. Proceedings of the *Data Compression Conference,* page 457. IEEE Press, Snowbird, UT, March 1995.

96. N. Memon and K. Sayood. Reversible Compression of a Video Sequence. *Visual Communications and Image Processing,* pages 1648–1661. SPIE Proceedings Volume 2308, Chicago, IL, October 1994.

97. N. Memon, S. Ray, and K. Sayood. Differential Lossless Encoding of Images using Non-linear Prediction Techniques. *Proceedings of the First IEEE International Conference on Image Processing,* pages 841–845, IEEE Press, Austin, TX, 1994.

98. N. Memon and K. Sayood. A Taxonomy for Lossless Image Compression. *Proceedings of the IEEE Data Compression Conference,* page 526. IEEE Press, Snowbird, UT, March 1994.

99. N. Memon and K. Sayood. Lossless Compression of Color Images in the RGB Domain. In *Applications of Digital Image processing XVII,* pages 95–106. SPIE Proceedings Volume 2298, San Diego, CA, July 1994.

100. N. Memon. Scan Predictive Vector Quantization of Multi-spectral Images. *Proceedings of the International Geosciences and Remote Sensing Symposium.* IEEE Press, San Diego, CA, March 1994.

101. N. Memon and M. Mareboyana. Vector Quantization Techniques using Predictive Ordering and Linear Approximation. *Proceedings of the International Picture Coding Symposium,* pages 166–169, Davis, CA, August 1994.

102. N. Memon and S. Ray. Ordering Color Maps for Lossless Compression. *Visual Communications and Image Processing,* pages 1192–1203. SPIE Proceedings Volume 2308, 1994.

103. N. Memon, K. Sayood, and S. S. Magliveras. Efficient Scan Patterns for Image Decorrelation. Proceedings of the *Thirty First Annual Allerton Conference on Communications Control and Computing,* pages 463–472, Allerton, IL, September 1993.

104. N. Memon, K. Sayood, and S. S. Magliveras. New Techniques for Reversible Compression of Multi-spectral Image Data. Proceedings of the *Computing in Aerospace 9 Conference*, pages 148–156, San Diego, CA, March 1993.

105. N. Memon, K. Sayood, and S. S. Magliveras. Lossless Image Compression Using a Codebook of Prediction Trees. Proceedings of the *Data Compression Conference*, pages 181–190, Snowbird, UT, 1992.

106. N. Memon, K. Sayood, and S. S. Magliveras. Lossless Image Compression with Efficient Scan Patterns. Proceedings of the *Twenty Sixth Annual Conference on Information Sciences and Systems*, page 256, Princeton, NJ, March 1992.

107. N. Memon, S. S. Magliveras, and K. Sayood. Prediction Trees and Lossless Image Compression. Proceedings of the *Data Compression Conference*, pages 83–92. Snowbird, UT, March 1991.

108. S. S. Magliveras and N. Memon. Random Permutations from Logarithmic Signatures. *Computing in the 90's*, volume 507 of *Lecture Notes in Computer Science*, pages 91–97. Springer-Verlag, Kalamazoo, MI, October 1989.

109. S. S. Magliveras and N. Memon. Properties of Cryptosystem PGM. *Advances in Cryptology - CRYPTO 89*, volume 435 of *Lecture Notes in Computer Science*, pages 447–460. Springer-Verlag, Santa Barbara, CA, August 1989.

Publications in Review

1. M. Ramkumar, N. Memon, R. Simha. A Hierarchical Key Pre-distribution scheme, submitted to *EIT 2005*.

2. D. Chen, Y-J Chiang, N. Memon and X. Wu. Lossless Geometry Compression for Steady-State and Time-Varying Irregular Grids. *Submitted to IEEE Transactions on Visualization*, March 2005.

3. D. Chen, X. Wu, Y-J Chiang, and N. Memon. Multiple-Description Geometry Compression for Networked Interactive 3D Graphics. *Submitted to IEEE Transactions on Visualization*, March 2005.

4. D. Trendifilov, T. Suel and N. Memon. ZDelta - A Delta Compression Technique and Some Applications, *Submitted to IEEE Transactions on Computers*, January 2004.

5. H. Ozer, N. Memon and B. Sankur. Detection of Audio Covert Channels Using Statistical Footprints of Hidden Message. *Submitted to IEEE Transactions on Speech and Audio Processing, Under Revision*, July 2003.

Book Reviews

1. Information Hiding. *Journal of Electronic Imaging*, August 2001.

2. A Compendium of Standards, *IEEE Spectrum*, March 1998.

3. Digital Compression Exegesis, Straight From the Apostles, *IEEE Spectrum*, September 1997.

Other Publications

1. M. Ramkumar, N. Memon, Security of Random Key Pre-distribution Schemes With Limited Tamper Resistance, Cryptology ePrint Archive, April 2004.

2. M. Ramkumar, N. Memon, HARPS: HAshed Random Preloaded Subset Key Distribution, Cryptology ePrint Archive, August 2003.

3. C. Chrysafis, A. Drukarev, S. Liu, and N. Memon. Some results on DCT based JPEG experiments, *International Standards Organization Working Document*, ISO/IEC JTC/SC29/WG1N748, Geneva, March 1998.

4. N. Memon and X. Wu. A Simple Inter-band Coding Extension of Baseline JPEG-LS. *International Standards Organization Working Document*, ISO/IEC/SC29/WG 1/N451, Garmisch, Germany, June 1997.

5. X. Wu and N. Memon. Suggestions for Near-lossless Compression. *International Standards Organization Working document*, ISO/IEC/SC29/WG 1/N467, Garmisch, Germany, June 1997.

6. X. Wu and N. Memon. Comments and Suggestions on Further Compression Gains. *International Standards Organization Working Document*, ISO/IEC/SC29/WG 1/N395, Palo Alto, CA, March 1997.

7. X. Wu and N. Memon. A Comparison of CALIC and LOCO. *International Standards Organization Working document*, ISO/IEC/SC29/WG 1/N274, Dallas, TX, November 1996.

8. X. Wu, N. Memon and K. Sayood. A Context-based, Adaptive, Lossless/Nearly-Lossless Coding Scheme for Continuous-tone Images. *International Standards Organization Working document*, ISO/IEC SC29/WG 1/N256, Epernay, France, June 1996.

9. Proceedings of *International Conference on Imaging Science, Systems, and Applications* July, 1997, Associate Editor.

Funded Grants

1. N. Memon (PI) Information Assurance Capacity Building $125,000. NSA/DoD. Sept 05 - 06.

2. N. Memon (PI), Source Camera Identification. National Institute of Justice. $350,000, Sep 05 - 07.

3. N. Memon (PI), Image Forensics. *AFOSR*, $260,000, Feb 2005- Jan 2007.

4. N. Memon (PI), H. Bronnimann, J. Wein, D. Salane and A. Schwartz ForNet: A Distributed Network Forensics System. *NSF*, $750,000. September 2004 - 2007.

5. R. Chandramouli (PI) and N. Memon (Co-PI). Fundamental and Practical Issues in Stochastic Filter Design for Image Steganalysis. *Air Force Research Labs, Rome, NY.* $161,500, June 2004 - 2005.

6. R. Simha (PI), A. Chowdhary (Co-PI), N. Memon (Co-PI) and B. Narahari (Co-PI). ITR: A Hardware/Compiler Co-Design Approach to Software Protection, *NSF*, $1,000,000, September 2003 - 2006.

7. N. Memon (PI), G. Naumovich (Co-PI), P, Frankl (Co-PI), R. Karri (Co-PI). Information Systems and Internet Security Laboratory, *Cisco Systems*, $90,000, September 2003.

8. N. Memon (PI). Audio Steganalysis Techniques, *Air Force Research Laboratories*, $260,000, September 2003 - 2005.

9. J. C. Birget (PI), D. Hong (Co-PI), N. Memon (Co-PI), S. Weidenbeck (Co-PI), Graphical passwords: design, analysis and human factors, *NSF*, $400,00, September 2003 - 2005.

10. N. Memon (PI). ForNet: A Distributed Network Forensics System. *DoD/NSA*, $98,000. September 2003 - 2004.

11. N. Memon (PI) G. Naumovich (Co-PI), P, Frankl (Co-PI). Information Assurance Scholarships. *NSA/DoD*, $128,000, September 2003 - 2004.

12. N. Memon (PI), E. Wong (Co-PI), X. Wu (Co-PI). Steganalysis Techniques for Documents and Images. *Air Force Office of Scientific Research*. $207,000. December 2002 - 2004.

13. N. Memon (PI), G. Naumovich (Co-PI), P, Frankl (Co-PI). Information Assurance Scholarships. *NSA/DoD*. $125,067. September 2002 - 2003.

14. N. Memon (PI), R. Karri (Co-PI). HINDER - Hardware Based Intrusion Detector. *NSA/DoD*. September 2002 - 2003.

15. G. Naumovich (PI), P. Frankl (Co-PI), N. Memon (Co-PI). Computing with Untrusted Code. *NSA/DoD*. September 2002 - 2003.

16. N. Memon (PI). US-Turkey Collaboration: Steganalysis Techniques For Images And Audio. *NSF*. $30,000. July 2002 - 2005.

17. X. Wu (PI) and N. Memon (Co-PI). An Algorithmic Study of Optimal Multi-resolution Quantization and Joint Source-Channel Coding. *NSF*. $300,000. June 2002 - 2005.

18. R. Chandramouli (PI) and N. Memon (Co-PI). A Mathematical Theory for Steganalysis. *Air Force Research Labs, Rome, NY*. $199,500, June 2002 - 2004.

19. N. Memon (PI), G. Naumovich (Co-PI), P. Frankl (Co-PI). Scholarship for service in information assurance. *NSF*. $3,950,000. June 2002 - 2006.

20. N. Memon (PI), G. Naumovich (Co-PI), P. Frankl (Co-PI). Capacity Building Project in Information Assurance Education. *NSF*. $198,162, June 2002 - 2004.

21. N. Memon (PI). Video Delivery Over Wireless Channels. *Mitsubishi Research*. $60,000. May 2002 - 2005.

22. Y. Chiang (PI) and N. Memon (Co-PI). Integrated Compression and Out-of-Core Techniques for Large Time-Varying Data Visualization. *NSF*. $400,000, September 2001 - 2004.

23. N. Memon (PI) and T.Suel (Co-PI). An Optimized Proxy-Based Architecture for Wireless Web Access" *Intel Corporation*. $70,000, April 2001 - April 2002.

24. N. Memon (PI) Steganalysis of Digital Watermarking Techniques. *Air Force Office of Scientific Research*. $190,000 March 2001 - 2003.

25. N. Memon (PI) and Y. Wang (Co-PI). Video Summarization. *Mitsubishi Research*. $90,000. Jan 2001 - 2003.

26. N. Memon (PI) and T.Suel (Co-PI). Optimized Content Delivery Over Wireless Channels, *Intel, Microcomputer Research Lab*, $74,600, July 2000.

27. N. Memon (PI) and G. Naumovich (Co-PI), Software Watermarking, *Panasonic Information Technology Lab*, $96,000, May 2000 - March 2002.

28. S. Chandramouli (PI)and N. Memon (Co-PI). Error Resilient Video Compression, *Sun Microsystems Equipment Grant*, $35,000, March 2000.

29. N. Memon (PI). Differential Transmission of Web Content over Wireless Channels, *Intel Research Equipment Grant*, $20,000, December 1999.

30. N. Memon (PI) and P. Frankl (Co-PI). An Undergraduate Laboratory in Computer Systems Security, *National Science Foundation*, $160,000, December 1999.

31. N. Memon (PI). Compound Image Compression, *Hewlett Packard Research Labs*, $20,000, June 1999.

32. N. Memon (PI). US-Turkey Collaborative Research on Subband Decomposition Based Lossless Image Compression Techniques, *National Science Foundation*, $30,000, July 1997.

33. N. Memon (PI). Lossless, Near-Lossless and Lossy Plus Lossless Image Compression, *National Science Foundation CAREER Award*, $205,000, May 1997.

34. N. Memon (PI). Development of a New International Standard on Lossless Image Compression, Graduate Council Committee on Research and Artistry, *Northern Illinois University*, $5,500, June 1996.

35. N. Memon (PI). Planning Visit for U.S.-Turkey Cooperative Research on Sub-Band Decomposition-Based Lossless Image Compression Techniques, *National Science Foundation*, $1,900, March 1996.

36. N. Memon (PI). Permutation Source Codes for Lossless Image Compression, *University of Nebraska* $5,000, October 1995.

37. N. Memon (PI). Compression Schemes for Multi-spectral Image Data - Graduate Council Committee on Research and Artistry, *Northern Illinois University*, $4,500, June 1995.

38. N. Memon (PI). Compression of Multi-spectral Image Data, Research Initiation Award, *Arkansas Science and Technology Authority*, $29,000 January 1994.

39. A. Talmadge (PI), A. Sustich (Co-PI) and N. Memon (Co-PI), A Establishment of a Multimedia Learning Environment, *Arkansas Dept. of Higher Education*, $80,000, April 1994.

40. N. Memon (PI). Establishment of a Research Group in Data Compression, *Arkansas Space Grant Consortium*, $8,151, October 1993.

41. N. Memon (PI). Lossless Compression of Multispectral Image Data, Faculty Research Council, *Arkansas State University*, $7,457, June 1993.

42. N. Memon (PI). Compression of Space Data, *Arkansas Space Grant Consortium*, $1,960, February 1993.

Professional Service

Editorships

1. Associate Editor. *IEEE Signal Processing.* Jan 06 - present.
2. Associate Editor. *IEEE Security and Privacy.* Jan 06 - present.
3. Associate Editor. *IEEE Transactions on Information Forensics and Security.* Jan 2005 - Current.
4. Associate Editor - *LNCS Transactions on Multimedia Security,* Sept 05 - current.
5. Associate Editor, *International Journal of Security and Networks.* July 05 - Current.
6. Editorial Board, *The Advances in Cryptology & Information Security (ACIS) series.* IOS Press. July 05 - Current.
7. Associate Editor, *Journal of Electronic Imaging.* Jan 2003 - Dec 05.
8. Associate Editor. *ACM Multimedia Systems Journal.* September 2001 - 2004.
9. Associate Editor. *IEEE Transaction on Image Processing.* March 1999 - 2002.
10. Guest Editor. Special Issue on Multimedia Security and Rights Management. *EURASIP Journal on Applied Signal Processing.* Expected Publication March 2004.
11. Guest Editor. Special Issue on Security of Data Hiding Technologies. *Signal Processing Journal.* Expected Publication August 2003.
12. Guest Editor. Special Issue on Multimedia Security *ACM Multimedia Systems Journal,* June 2003.
13. Guest Editor. Special Issue on Signal Processing for Data Hiding in Digital Media & Secure Content Delivery. *IEEE Transactions on Signal Processing.* April 2003.
14. Project Co-editor - *JPEG-LS Extensions,* Lossless Compression Standards Project, JPEG/JBIG, International Standards Organization, November 1997 - 1999.

Technical Committees

1. Technical Committee on Multimedia Signal Processing. *IEEE Signal Processing Society.* 2005 - Current.
2. Technical Committee on Information Security and Forensics. *IEEE Signal Processing Society.* 2005 - Current.

Standard's Committees

1. Ad-Hoc Committee Member, *JPEG-LS,* Lossless Compression Standards Project, JPEG/JBIG, International Standards Organization, June 1996 - 1999.
2. Chair - Ad-hoc group on convergence. Lossless Compression Standard Project, International Standards Organization JPEG/JBIG committee meeting, Garmisch, Germany, June 1996 and Palo Alto, California, November 1996.

Organizing Committee

1. Local Arrangements and Finance Chair. *ACM Multimedia Security Workshop.*, August 2005.

2. Special Session Organizer. *Image Forensics*, International Conference in Image Processing, Singapore, September 2004.

3. Organizing Committee, NY State Cyber conference, Hudson Valley, NY, November 2003.

4. Track Chair. *Information Networking*, ITRE 2003, Newark, NJ, July 2003.

5. Track Chair. *Watermarking and Security*, ICME 2003, Baltimore, June 2003.

6. Special Session Organizer - *Watermarking Protocols*, Security and Watermarking of Multimedia Contents IV, San Jose, CA, February 2002 and 2003.

7. Special Session Organizer - *Digital Watermarking*, Multimedia Systems and Applications IV, ITCOM, Denver, August 2001.

8. Digital Media Co-Chair, *IEEE Conference on Multimedia and Expo*, New York, NY, July 2000.

9. Session Organizer - *Multimedia Content Protection*, IEEE International Conference on Information Technology: Coding and Computing, Las Vegas, NV, March 2000.

10. Session Organizer - *Image Security*, Multimedia Systems and Applications, Boston, MA, September 1999.

11. Session Organizer - *Still Image Compression*, 32'nd Asilomar Conference, Monterey, CA, November 1998.

12. Session Organizer - *Data Compression and Signal Processing Applications*, 31'st Asilomar Conference, Monterey, CA, November 1997.

13. Session Organizer - *Data Compression in Remote Sensing* International Geosciences and Remote Sensing Symposium, Lincoln, NE, May 1996.

Session Chair

1. *Image Froensics*, International Conference in Image Processing, Singapore, September 2004.

2. *Steganography and Steganalysis*, Security and Watermarking of Multimedia Contents, San Jose, CA, February 2002.

3. *Networking Protocols*, ITRE 2003, Newark, NJ, July 2003.

4. *Oral Session on Watermarking*, ICME 2003, Baltimore, June 2003.

5. *Authentication Protocols*, Security and Watermarking of Multimedia Contents V, San Jose, CA, February 2003.

6. *Watermarking Protocols*, Security and Watermarking of Multimedia Contents IV, San Jose, CA, February 2002.

7. *Communications Approach to Watermarking* Security and Watermarking of Multimedia Contents, San Jose, CA, February 2001.

8. *Lossless Image Compression*, IEEE International Conference on Image Processing, Vancouver, Canada, September 2000.

9. *Web Search/Retreival and Applications*, IEEE Conference on Multimedia and Expo, New York, NY, July 2000.

10. *Multimedia Content Protection*, IEEE International Conference on Information Technology: Coding and Computing, Las Vegas, NV, March 2000.

11. *Still Image Coding*, Visual Communications and Image Processing, San Jose, CA, February 2000.

12. *Image Watermarking*, Security and Watermarking of Multimedia Content, San Jose, CA, February 2000.

13. *Image Security*, Multimedia Systems and Applications, Boston, MA, September 1999.

14. *Watermarking of Text, Graphics, and Halftones*, Security and Watermarking of Multimedia Contents, San Jose, CA, February 1999.

15. *Lossless Image Compression*, IEEE International Conference on Image Processing, Chicago, IL, October 1998.

16. *Still Image Compression*, 32'nd Asilomar Conference, Monterey, CA, November 1998.

17. *Data Compression and Signal Processing Applications*, 31'st Asilomar Conference, Monterey, CA, November 1997.

18. *Multimedia Security*, International Conference on Imaging Science and Technology, Las Vegas, NV, June 1997.

19. *Data Compression in Remote Sensing*, IEEE International Geosciences and Remote Sensing Symposium, Lincoln, NE, May 1996.

20. *Data Compression in Remote Sensing*, IEEE International Geosciences and Remote Sensing Symposium, San Diego, CA, July 1994.

Program Committee

1. *International*

2. IEEE International Conference on Image Processing, *1999 - 2005*.

3. International Workshop on Digital Watermarking, *2003 - 2005*.

4. Multimedia Systems and Applications, *Boston, 2000 - 2004*.

5. IEEE Conference on Multimedia and Expo, *2000 - 2005*.

6. Security and Watermarking of Multimedia Contents, *San Jose, CA, 1999 - 2006*.

7. IEEE International Conference on Information Technology: Coding and Computing, *Las Vegas, NV, 2000 and 2001.*

8. Communications and Multimedia Security, *Darmstadt, Germany, May 2001.*

9. International Conference on Imaging Science and Technology, *Las Vegas, NV, June 1997.*

10. International Geosciences and Remote Sensing Symposium, *Lincoln, NE, 1996.*

Invited Panels, Tutorials and Keynote Talks

1. Digital Watermarking and Steganography. Invited Tutorial. SPCOM 2005, Indian Institute of Science, Bangalore. December 2004.

2. Information Hiding - Theory and Application. Invited Tutorial. Institute of Mathematical Sciences, National University of Singapore, December 2003.

3. The Future of Steganography. Invited Panel Member. NY State Cyber Security Conference, Hudson Valley, November 2003.

4. Image Steganography - Theory and Practice. Invited Keynote Speech, International Workshop on Digital Watermarking, Seoul, Korea, October 2003.

5. Fornet: A Distributed Network Forensics System. Invited Keynote Speech. Mathematical Models and Architectures for Computer and Network Security, St. Petersburg, Russia, October 2003.

6. Invited Panel Member. Signal Processing Magazine Forum on Information Hiding, 2003.

7. The Future of Digital Watermarking. Invited Panel Member. Multimedia Signal Processing Workshop, Virgin Islands, November 2002.

8. Digital Watermarks - Invited Panel Discussion, *Workshop on Multimedia Security, IEEE Multimedia Conference*, Austin, TX, July 1998.

9. Report on New International Standard for Lossless Image Compression. Invited Panel Discussion, *IEEE Data Compression Conference*, Snowbird, UT, March 1996.

Affiliations

Member - ACM, IEEE, SPIE,, IEEE Signal Processing Group.